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Research and practice on engineering mathematical bilingual teaching

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Abstract

This paper is based on the object of engineering mathematical bilingual teaching, makes systemic research on Contents, methods and evaluation, and provides the support system of engineering mathematical bilingual teaching according to reality.

Keywords: Engineering Mathematics; Bilingual Teaching; Research and Practice

1. Introduction

The establishment of creative country needs cultivate a great many creative talents being accomplished in professional knowledge and foreign language. As a result, practicing bilingual teaching to cultivate talents with international view, consciousness and communication ability is one of important goals in China's Higher Education Reform.

Engineering mathematics is an important basic course in engineering college. On the one hand, mathematical bilingual teaching is offered with common foreign language teaching in the first and second years in college, which support each other; on the other hand, engineering mathematics is the base of other subjects, mathematical bilingual teaching provides the foundation of understanding specialty English, and it has caused great public concern in recent years.

We have systematically made research and exploration since 1997. First we establish the teaching objective, following which we make research on teaching contents, methods and evaluation, and provide

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the support system of mathematical bilingual teaching. This research has been supported by Henan Province Education Department and Ministry of Education, and carried out the regional cooperation with Beijing agricultural college and Gansu agricultural university. These experience lead to the establishment of foundation of developing mathematical bilingual teaching roundly.

2. Teaching objective

The objective of bilingual teaching is to both make students study professional knowledge, and develop skills of English listening, speaking, reading, writing, studying and thinking by osmosis, which leads to the development of professional knowledge and English abilities. Therefore, the objective of mathematical bilingual teaching should be the combination of the following objectives:

- Basic objective: acquiring the same knowledge and abilities as Chinese teaching, which is the fundamental of teaching.
- Second point Direct objective: acquiring the abilities of gaining knowledge by using English to think mathematically, and the abilities of transforming freely between two languages according to the communication object and circumstance.
- Indirect objective: acquiring the foreign teaching ideals and methods indirectly, and exploring the international perspective.

3. Teaching contents

The one of difficulties of bilingual teaching lies in the lack of teaching materials suitable to China. Original editions of teaching materials from abroad are different from the courses system of China, their contents are dissimilar to China society environment, and the degree of difficulty is not symmetric with respect to the English proficiency of students. In the practice of teaching, we find that the best way of solving the above problem is to make reconstruction on the original editions based on the localization. After finishing Textbook Series for 21st Century, we learn from the foreign textbooks, and publish four 11th Five-Year Programmed Textbooks for the countrywide higher agricultural university: 《Engineering Mathematics》, 《Engineering Linear Algebra》 and 《Probability and Statistics》, which provides a solid foundation for bilingual teaching.

4. Teaching methods

A correct teaching method is the approach to the teaching objective. We make repeated optimization on every teaching step, and establish the following teaching Strategies:

- Express in English and explain in Chinese. That is, we use English to express definitions and theorems, and use Chinese to explain; analyse examples in Chinese, provide solutions in English, and express mathematical formulas in English.
- Pay much attention to questioning, reinforce spoken English, and make students obtain the ability of acquiring knowledge by using English to think.
- Provide the major words and phrases to be used at the beginning of class, and use Chinese and English to summarize the class finally.
- For the convenience of students, we collect vocabularies of mathematics into a book, and summarize the common fixed expression for students' reference.
- Require students to use English to finish exercises and examination.

- To solve the problem of shortage of class hours, we make English courseware to decrease the writing time, and show many dry concepts and theorems as the intuitional graph and vivid cartoon, which attributes the understanding and studying of students.
- Practice gradation teaching. Bilingual teaching is different from mother-tongue teaching, which requires solid mathematical foundation, but more importantly strong English ability. To ensure the teaching effect, we first make English tests, students are grouped into classes according to the grade, and each class has population within 60. To the students with poor English, we teach in Chinese.

5. Evaluation methods

Examination is a method, but more important form reflecting the grasping of knowledge of students. Examination aims at the reinforcement of education, relieves the stress, and inspires the passion of students. We change the evaluation of teaching effect from paying more attention to result to paying more attention to both process and result, making it diversified.

5.1. Diversification of evaluation

We evaluate the learning of students from usual performance and examination result. From the knowledge and the ability of foreign language communication and application, we can make evaluation from many aspects and angles. Attendance, assignment, foreign language communication and classroom test form the usual performance, accounting for 20%; final course grade accounts for 80%.

5.2. Strengthen the evaluation of English ability

The one of goals of bilingual teaching is to improve the ability of using English. In teaching, teaching materials, assignment, courseware and paper are given in English, communication in classroom is performed in English, which aims at creating a good English-learning environment. And we usually evaluate the ability of using English from questioning, classroom test, assignment and so on.

6. Supporting measures

6.1. Strengthen the construction of teaching staff

High-level teachers are the prerequisite of bilingual teaching. Since 2002, we have strengthened the evaluation of English ability in bringing in talent, and a lot of high-level teachers fill in our group; on the other hand, we attach great importance to the training of teachers, and make further improvement on the teaching standard of teachers. Since 1996, our group has been based on the English-training centre of college, and a two-year intensive training of English was offered for all teachers, which was very effective. At present, more than 90% of 23 teachers in group has passed the CET 4 and CET 6.

6.2. construct the evaluation system of bilingual teaching

We should construct the evaluation system of bilingual teaching, evaluate the teaching effect of bilingual courses, find and solve the problems in bilingual teaching in time, and ensure the quality of bilingual teaching.

- Comparison and evaluation: in the mid-term exam, we use the same examination papers with the Chinese teaching class (the paper for bilingual class is in English), analyse the exam results, and evaluate the studying effect;
- Student evaluation: at the end of term, we distribute the questionnaire to students, and the teaching is evaluated by students;
- Teacher evaluation: at the end of course, classroom teachers evaluate the teaching of course completely. The teaching group synthesizes various evaluation, find and solve problems in time.

6.3. Establish the incentive mechanism

Since it requires a great deal of time and energy to make the bilingual course, rewards system should be made to stimulate the enthusiasm of teachers for practicing bilingual teaching. Teachers enjoy the workload subsidy in bilingual teaching, and they have the priority in teaching evaluation, annual evaluation, excellence evaluation, establishment of teaching and reforming project and evaluation of Excelsior course.

6.4. Strengthen the construction of teaching website

The website has been a new means of learning for students, and the continually developing and perfecting of websites becomes an important task of the construction of courses.

- Refer to the experience of construction of domestic and abroad websites, enrich the content of website, on the promise that the website is academic, increase interest and advance to the website.
- Construct and perfect exercises, and make the autonomous learning courseware.
- Collect, classify and perfect the information of authentic websites, and make some videos relating to engineering mathematics for students.

7. Conclusion

Our group makes research on bilingual teaching, explore the pattern of bilingual teaching of engineering mathematics, and provide valuable experience for the bilingual teaching of engineering mathematics. Since 2008, we have made two exploration of bilingual teaching on students of life science college of Henan agricultural university in 2008 and 2009, and have a good teaching effect. However, bilingual teaching is a complicated system, a lot of problems are needed to study, and the mathematical bilingual teaching is not known by some people, which need more support of school. We believe that the goal of mathematical bilingual teaching will be realized with our continuing efforts, and we can contribute to the training of talent for higher schools.

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